TECHNOLOGY NEEDS/OPPORTUNITIES STATEMENT
LONG TERM MONITORING SENSORS NEED

Identification No.: RL-DD37-S
Date: November, 2001

Program: Environmental Restoration
OPS Office/Site: Richland Operations Office/Hanford Site
PBS No.: RL-CP01
Waste Stream: LLW Debris (ER-05, risk = 4) and MLLW Debris (ER-02, risk = 4)
TSD Title: N/A
Operable Unit (if applicable): N/A
Waste Management Unit (if applicable): N/A
Facility: Materials Processing Facilities

***Priority Rating*:**

This entry addresses the "Accelerated Cleanup: Paths to Closure (ACPC)" Priority: Select a "1", "2" or "3" to assess the impact of the need/opportunity relative to the current site baseline.

____ 1. Critical to the success of the ACPC
__X_ 2. Provides substantial benefit to ACPC projects (e.g., moderate to high lifecycle cost savings or risk reduction, increased likelihood of compliance, increased assurance to avoid schedule delays)
____ 3. Provides opportunities for significant, but lower cost savings or risk reduction, and may reduce uncertainty in ACPC project success.

***Need Title*:** Long Term Monitoring Sensors Need

Need/Opportunity Category: Science Need

***Need Description*:**
Long-life, cost-effective, remote recording sensors are needed for the identification and monitoring in soils and ground waters of numerous analytes that have the potential for leaking out of facilities on the Hanford site.

In order to identify and quantify the species required (Table 1), novel sensors with low detection limits and robust construction must be developed. This will include the development of new construction materials, development of new techniques for detection and quantification of the analytes of interest, and new methods for remote/centralized collection of the data obtained by the sensors. This will necessarily include looking at the fields of electronics, electrical engineering, microfluidics, and chemical physics to better understand the underlying principles of sensor design and development. The main analytes of concern for the D&D project are shown in Table 1.

Table 1. Contaminants of Concern	
Contaminant of Concern	Required Detection Limit*
Acids	0.1
Ammonium Fluoride – NH_4F	0.2
Hexone	0.002
Nitrates	0.1
Kerosene, normal paraffin hydrocarbons	5
Lead	0.4
Polychlorinated Biphenyls	0.05
Phosphoric Acid	2
Dichromate	0.5
Nitrite	0.1
Sulfate	2
Tributyl Phosphate	0.5
Am-241	1
Co-60	0.1
Cs-137	0.1
Eu-152/154	0.1
Np-237	1
Pu-238, Pu-239/240	1
Sr-90	1
Th-232	1
U-234, U-235, U-238	1
Gross alpha	10
Gross beta	15
* Detection limits are for full protocol. Currently available onsite capabilities are an order of magnitude worse. Values are in mg/Kg or pCi/g.	

Schedule Requirements:
Earliest Date Required: 9/30/2003
Latest Date Required: 9/30/2025

***Problem Description*:**
Many of the facilities are to be placed in safe storage followed by long term monitoring prior to final disposition. In order to satisfy regulators and the public, a large number of chemical and radiochemical materials (see Table 1) that may leak from the facilities need to be monitored on a real-time basis in a cost-effective manner. In addition, the materials need to be monitored at levels currently unattainable with field monitoring equipment and the monitors must be able to perform over long periods of time with little or no maintenance, since some of the monitors will be located in radiologically and chemically hazardous environments.

Potential Life-Cycle Cost Savings of Need (in $000s) and Cost Savings Explanation:
Rough order of magnitude (ROM) life cycle cost (LCC) savings of $1M. LCC savings estimate is based on the assumption that long-term monitoring technologies would reduce the total cost of the waste emplacement option by 0.1%.

Benefit to the Project Baseline of Filling Need:
The development of new sensors will drastically reduce the requirement for expensive sampling campaigns followed by laboratory analysis. It will also allow for continuous real-time measurement to catch potential leaks early, decreasing the cost of remediation, if required, as well as reducing risk to health and the cost of long-term monitoring.

✗ Cost Savings ✗ Risk Reduction ✗ Enabling Knowledge

This Science Need also supports the following Hanford Technology Needs: RL-DD052

Relevant PBS Milestone: PBS-MC-030

End-User: Environmental Restoration Contractor

Contractor Facility/Project Manager:
Gary MacFarlan, BHI, (509) 373-6876, (509) 373-7606, gmmacfar@bhi-erc.com

Site Technical Points of Contact:
Kim Koegler, BHI, (509) 372-9294, (509) 372-9654, kjkoegle@bhi-erc.com
Sue Garrett, PNNL, (509) 375-2398, (509) 375-5921, sue.garrett@pnl.gov

DOE End User/Representative Points of Contact:
John Sands, (509) 372-2282, (509) 372-0726, John_P_Sands@rl.gov
Paul Valcich, (509) 373-9947, (509) 373-9838, Paul_J_Valcich@rl.gov